Safety and Mission Success Week Data Analysis

Executive Summary

As a part of Safety and Mission Success Week, everyone across the Agency was given a copy of the Colombia Accident Investigation Board (CAIB) report and the Diaz Matrix. Management was asked to provide time for employees to read both documents, and to hold work unit discussions regarding the applicability of the CAIB findings. Safety and Mission Success Week was designed to facilitate open communication, and to engage the entire NASA community in addressing the CAIB Report. Each Center Director was asked to champion the week's events and collect feedback from their workforce. After holding the work unit discussions, Center Directors were asked facilitate a data rollup into the main ideas from their Center.

These data were then analyzed and validated by a subset of the One NASA Team. This "Data Team" included members from ARC, GSFC, GRC, and JSC. The team examined the final Center reports and identified ten categories used by at least one center. These categories were used as bins for each of the 1810 comments examined. The categories were: Change Management, Civil Service/Contractor Issues, Communication, Culture, Engineering and Technical, Leadership, Learning, Organizational Structure, Resource Management, Safety, and Other. As a result of assigning comments to these categories, several themes emerged as commonalities across one or more category. The themes were then examined against the original Center Reports for verification. This three-phase analysis resulted in a final list of ten actionable crosscutting themes that were represented as main ideas on three or more Center reports.

- NASA needs an increased value on respect for others. All those affected by the decision should be part of the decision making process. Leaders should have the responsibility to provide employees with full information regarding decisions, including options considered, and rationale for making final choice.
- NASA should willfully seek out and understand minority opinions. This includes establishing a process to collect anonymous feedback, and holding meetings that encourage open discussion.
- Resources including time, human capital, and cash flow should be allocated realistically and according to the design standards set forth at project conception.
- NASA needs more emphasis on the entire lifespan of projects to avoid being tied up in unnecessary processes, or lengthy approvals that draw resources away from goal achievement. Appropriate procedures should be established, and followed from project conception to completion.
- Decisions should be made based on what is best for the Agency, be placed in context using Agency priorities, guide allocation of resources, and be fully rationalized and communicated to the workforce.
- Strategic planning should be relevant for every employee, include human capabilities needed for the future, and be the baseline for on going initiatives.
- The agency needs a strategy for leadership development that includes/supports a specific set of skills for all levels of management. These skills should then be used for evaluating performance and making personnel decisions such as promotions and awards.
- NASA should use/design ONE tool to capture expertise and lessons learned in all areas. Tool should be easily accessible, and actively used by the workforce.
- NASA needs to clarify the organizational structure of the Agency. Current matrix system is too complex and is not perceived as a useful management tool.
- NASA needs a truly independent safety organization as described in the CAIB report. This organization should serve as a clearinghouse for any safety related concerns from any employee.
- Safety expertise should exist for every specific discipline within the Agency.

In addition to this list of 10 Themes, one additional theme not addressed as a Main Theme in any Center Report, yet emerged as we analyzed the entire data set.

- Contractors should not be used to supply core competency expertise. Building from an inclusive strategic plan the Agency should determine what capabilities should be kept in house, and what capabilities should be provided by contractors.

Data Description

At the conclusion of Safety and Mission Success Week, each Center (including JPL and HQ) submitted a brief report that outlined the main ideas or themes from work unit discussions. The One NASA Team was asked to examine each Center Report and develop a set of common themes that would encompass the ideas brought forward by all of the Centers.

The Center Reports varied in length and in level of detail provided. In many cases, the Center brought forward a short list of three to five main ideas from their Center along with specific examples or quotes. In other cases, the Center provided both overall themes and themes broken out by department. In addition to the data from the 10 Centers, the One NASA Team was provided with direct feedback from employees received via the SMS website, as well as written summaries from various contractors and specific departments.

Given the wide range of data received, and the range of processes used by various Centers to collect information – the One NASA Data Team chose to analyze the data based on its face value, as it was presented. In doing this, every comment (summary or otherwise) was given equal weight, regardless of where it came from, or the process used to collect it.

Due to the variability in data type and in collection methodology, this analysis is not intended to be statistically representative of the entire Agency. *It is simply an effort to summarize the reports that were presented, and should only be interpreted as such.*

Data Analysis Phase I: Main Categories

To create a single set of data to analyze each Center report was taken out of Word format and copied into an Excel spreadsheet. In doing this with every report presented, and including the individual comments from various sources, the result was a spreadsheet of 1810 comments. Each of these comments was then placed into one or more main categories by the One NASA Data Team. The categories were derived from the Center Reports. In examining these reports there were 10 broad categories that were used by at least one Center to summarize the data. Using the following categories and operational definitions, the team was able to assign comments to each Category.

The initial categories with their operational definitions were:

Change Management: Includes change initiatives and their number, effectiveness, planning, etc. Initiatives include IFMP, One NASA, @nasa.gov email system, etc.

Communications: Includes information content and distribution processes and their effectiveness but not systems such as hardware, or technical issues such as those relating to hardware or software. Also encompasses dissenting opinions, their de-emphasis, and procedures for expressing them.

Culture: This is restricted to the following since it could be everything: values, widespread assumptions, change issues, many inter-Center issues such as not working together, emphasis on hierarchy and chain-of-command, hierarchy and over-emphasis on employee level. Category does not include learning, safety, organizational structure, dissenting opinions, or any of the other specific categories below.

Civil Service/Contractor Issues: Includes both the perceived tension and different statuses between the two groups and the perceived decrease of skills in the Civil Servants relative to the Contractor population. Also includes the working and contractual relationships and processes between NASA and Contractors.

Engineering and Technical: Issues having to do exclusively with technology or engineering specifications, production, systems, changes, etc. but not related issues such as the lack of technical expertise or systems or processes for communicating technical information.

Leadership: Includes issues relating to executives, managers and supervisors at all levels such as the need for them to do more planning, the goodness/effectiveness of the decisions of leaders, performance evaluation, their visibility, issuing of guidance, and development of visions for the future of organizations.

Learning: Includes both individual and organizational. Includes emphasis, funding, processes such as knowledge management, training, and all other forms of teaching/learning as well as cultural issues such as whether NASA has a culture conducive to learning.

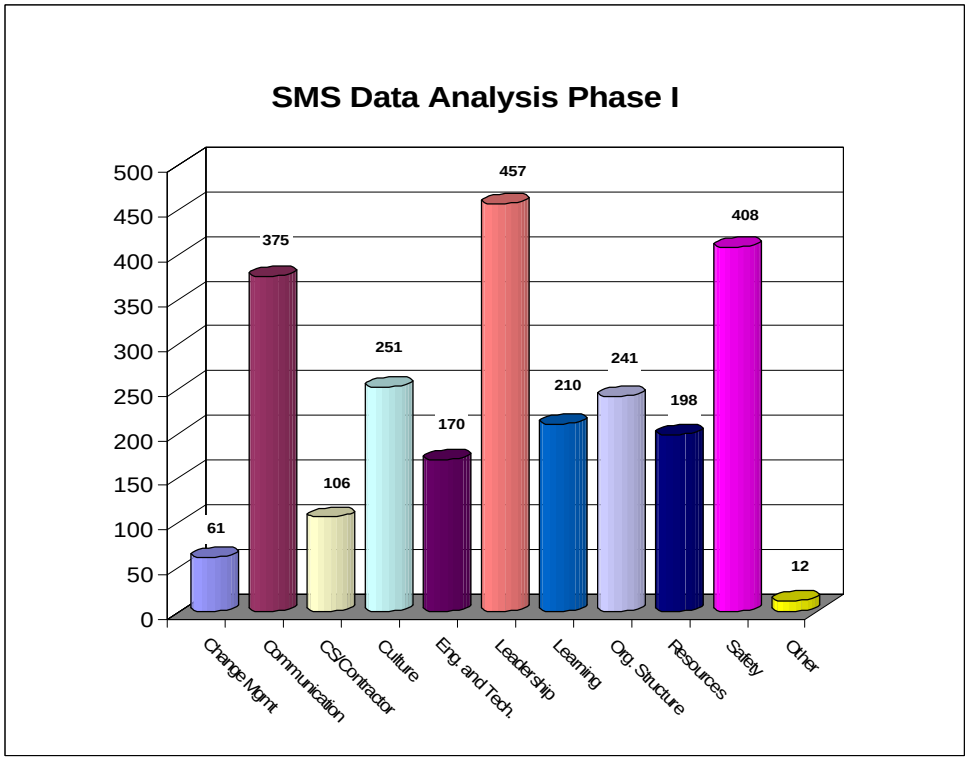
Organizational Structure: Includes Center and Agency level issues relating to relationships between and among organizational elements such as Directorates, Enterprises, etc. Does not include issues relating to the relationship between NASA and Contractors. See Civil Service/Contractor Issues for the latter.

Resource Management: Issues relating to the availability of funds and personnel, as well as schedules that impact funds and or personnel. Also includes issues relating to the duplication of effort across Centers or the Agency as well as the wasteful use of funds or personnel.

Safety: Includes cultural and contractual issues as well as emphasis on safety, and the structure of organizations as they relate to promoting safety. Also includes risk and its measurement, assessment, and risk taking attitudes and tolerance.

Other: Includes comments that do not clearly fit into any one of the above categories.

Assigning the raw data to these categories resulted in the following distribution:



Data Analysis Phase II: Identification and Explanation of Sub-Categories

Each category was then assigned to a member of the One NASA Data Team. For each category, the assigned comments were examined and a list of 3-5 subcategories was identified. Under each subcategory, direct quotes from the data set were selected to explain that particular subcategory. This section identifies each Category, and explains the sub-categories that were developed.

CHANGE MANAGEMENT

The data associated with this category centered on two main themes. The first theme is associated with the overwhelming number of initiatives currently underway and the resources necessary to implement those initiatives that potentially draw from mission critical efforts. The second strong theme in this category had to do with the CAIB and SMS week and what (if anything) will actually happen as a result of this effort.

Number of Initiatives across the Agency: Concerns about initiative overload particularly in the financial management arena.

- "NASA technical personnel are faced with major administrative initiatives (i.e. ISO, IFMP, workforce competency database, VPP) that compete with resources dedicated to achieve NASA's scientific and technical mission. Many of these well-intentioned efforts are implemented with the goal of increased efficiency, productivity, and safety. However, it is not apparent that this goal is being achieved in several instances."

Comments Concerning Safety and Mission Success Week: Several comments suggested that there is a healthy amount of skepticism that any real change will result from the CAIB and SMS week activities.

- "Many thought that after this review of the CAIB report, minimal action will occur, and we will back to business as usual."
- "There is NOTHING here we have not heard before. It's time to move out from discussion phases to take actions and to address these findings and recommendations."

CIVIL SERVICE/CONTRACTOR ISSUES

There are three primary themes in the Civil Service/Contractor category. The data presented here point to the lack of inclusion within the Agency as it pertains to the contractor community. From a strategic point of view, many civil servants at NASA are concerned that too many core capabilities are being outsourced to contractors. In addition, there is a growing concern that the Agency relies too heavily on the contractor workforce, thus reducing the in-house technical capability.

Contractors treated as second-class citizens: Contractor personnel are treated as second-class citizens within the Agency – There are many examples on these issues. They include working conditions (contractors work on days that civil service personnel is off), unfair treatment (lack of trust and respect towards contractor personnel), communication between civil service and contractor seems to be a constant problem, etc. Contractors seem to have some of the technical skills and experience that civil service personnel lack in many areas. This creates discord between civil service personnel, who are the ones who provide oversight to programs and projects, and contractor personnel, who perform the actual tasks.

- There are too many "walls" between CS and Contract employees. Contract staff are the majority at NASA, yet are not considered an equal part of the NASA team. Legal ramifications and cultural concerns prevent this very important knowledge base from openly and freely discussing issues that could ultimately become safety concerns.
- Contract staff have expressed they feel like "second-class citizens" at the Center.
- Contract staff are expendable (nature of contracts), staff afraid to speak out for fear of losing employment
- Civil Service staff often does not include Contract Staff in high-end discussions even where contractor experience may exceed that of CS
- CS staff perpetuates notion that Contract Staff are less valuable

Deterioration of Civil Servant capability: The technical skills of Civil Service personnel are deteriorating. The reduction of civil service personnel has created an over reliance on contractor personnel. Many civil service employees' duties include the oversight of the contractor personnel. Because of this arrangement, many have not maintained their technical skills, and the Agency has lost the expertise to perform this type of work. Many managers do not require training plans of their personnel to maintain the technical skills. In some cases, the highly skilled civil service personnel retire, only to be hired by contractors. NASA internal competition among programs and Centers is affecting the reduction of technical skills within particular areas. NASA has difficulties competing with private sector for skilled personnel. NASA cannot offer what the private sector provides in the area of pay and incentives.

- "Skill retention exists on both NASA and it contractors, no succession planning for retirements."
- "Continuously recalling of retires to support critical issues/investigations".

NASA's over-reliance on contractors: Management does not have the skills to manage this complex organization- there are several statements that indicate a view that NASA management does not know how to manage the Agency. Failure developing policies, establishing goals and objectives, maintaining schedules, enforcing requirements are some the examples cited. The reliance on contractors affects the way project and programs are managed, especially when civil service personnel are also part of the process. The demands on contractors are different that on Civil Service personnel. Establishing difficult demands on deliverables to contractors and not for civil service personnel is a major complaint. It creates a difficult environment to work as a team.

- We continue to erode our skill set by externally outsourcing technical work.
- Center's increased reliance on contractor support and erosion of civil servant skills
- The CAIB Report indicates we are relying too heavily on contracted efforts and that we should strengthen what we do in-house. However, OMB/HQ seems to be asking for contracting out more if not all of our research. In-house research is unappreciated and has to take the back seat to contract efforts.

COMMUNICATIONS

The comments were grouped into three main themes consisting of 1) disdain for bad news, 2) managers (leaders) not doing what they say, and 3) observations on how we communicate. Based on the data set analyzed, communication is a very important area of concern across the Agency workforce. References to communication were also made in numerous comments in other categories as well.

Lack of a process for delivering upward feedback: The predominant theme voiced within the communication category was that neither NASA nor contractor management wants to deal with bad news or dissenting opinions. The perception is that the all-to-common reaction is to not listen, not understand/believe, not pass it on, and/or penalize the messenger. To follow are a few comments that represent this area of concern.

- "Operational and safety information is suppressed at lower levels to the point that most middle managers aren't aware of many concerns that have cropped up. This system results in only good news going uphill, bad news is largely suppressed. This results in a system where risk is accepted by the lowest levels without management having the opportunity to accept risk. This is completely unsafe, and will only stop when upper/middle management actively seeks the dissenting opinions (gets out in the field!)"
- "Fear of retribution for speaking against a group decision is clearly an issue at all levels. This includes fear of: Losing contracts, being "frozen" in career path or moved out of position, being passed over for key projects, and experiencing tarnished reputation or professional ridicule."
- "It is very intimidating for us or even developer staff to express minority opinions. The thought of going before the [program panel name deleted] to request a change to software is daunting…The program management doesn't encourage minority opinions."

Leaders do not follow words with actions: The second most prevalent theme voiced in the comments was that managers (leaders) do not do what they say. This sends a confusing message that undermines trust and respect. Actions must match words. To follow are a few comments that represent this area of concern.

- "There is a hesitancy to communicate with someone in authority who has the power to change something or make something happen. We say that people have the right to stop work, but the first time they do and they

get jumped on for it, we lose everything that we tried to gain. That's why it is so important for management to support and back the employees."
- "NASA doesn't practice what they preach - saying 'if it is not safe - say so', differing opinions are shot down so after awhile you stop speaking out."

Message of "what" is delivered without "why," leaders should close the loop: The third significant theme voiced in the comments concerned aspects of how we communicate. Effective communication requires considerable effort. Leaders should error on the side of more rather than less communication, using all means available. Leaders should feel a need to explain the rationale for their decisions. To follow are a few comments that represent this area of concern.

- "Communication affects all other categories and is critical to successful Center and Agency operations and achievement of mission objectives."
- "More face-to-face communication (less email)"
- "The only communication that goes up the management chain is a weekly note that must be abbreviated to two or three sentences. Any engineering concern of any significance is completely whitewashed by the time upper-level management sees it."

CULTURE

Input received reflects the need for NASA to embed a culture that values and promotes respect and cooperation, minority opinions and alternative courses of action, a balanced and realistic use of resources, and focuses on the entire lifespan of projects.

Respect for others and cooperation: Comments that were included here focused on a need for increased emphasis on teamwork and a renewed emphasis of respect for each other. This category also reflects the isolation and mistrust felt by some employees.

- "Mistrust exists between some organizations where similar work is performed and boundaries are unclear."
- "Standards of conduct and ethics must be practiced and enforced"
- "Practice simple respect for fellow workers; eliminate class differences and the feeling of being "less important than others."

Embrace minority opinions: Comments included under "embrace minority opinions and alternatives to status quo" reflect a need for the Agency to create an open atmosphere where disagreements are encouraged, and new ideas/alternatives pursued.

- *Reluctance to deal with the "negative." The Agency seems focused on the "positive." NASA doesn't seem willing to take/accept constructive criticism."
- "It is also common to accept "expert" (or even non-expert) word as truth without checks and balances or back-up verification"
- "People are afraid to question any decision made outside of their own offices."

Balanced and realistic use of resources: These comments reflect the negative effects of a "can-do" culture. In response to an historic trend of doing more with less NASA has successfully taught employees to meet deadlines at all costs.

- "Silence is taken as support or acceptance rather than cause for concern. People feel uncomfortable communicating anything other than a "can-do" attitude, such as telling leaders and managers that unrealistic deadlines do not work."
- "We should not have so many willing to 'ride the edge' when it comes to safety of the vehicle and her crew to meet schedule and budget restraints." We should strive to produce a product that is better than expected and improving it every day."
- "The CAIB report addresses the issue of scheduling pressures impacting decision-making. This is a cause of the current culture of NASA and does not appear to have changed since the accident. One example is

the process for submitting comments about the CAIB report. At our Center, the report has distributed a week late and people were not given an adequate time to read the report. This goes back to wanting to remain on schedule at all costs. It appears that we are being driven by schedules for this activity. For what should be an important activity, it appears that NASA is just "checking the box."

ENGINEERING/TECHNICAL

The data reflect the need for an increased focus on the technical capability of the Agency. The comments that were included in this category point to the importance of updating equipment and infrastructure to more easily facilitate the use of existing expertise. Taking advantage of existing expertise was related to both involving technical personnel in the decision making process, and eliminating the need for non-essential processes that pull resources away from the technical environment.

Upgrade facilities and equipment: Need to eliminate obsolete equipment, upgrade facilities, and equipment – There are several references to specific systems and equipment. There seems to be a concern that our facilities and equipment are not to the level necessary to achieve the Agency's goals and objectives. The need to ensure that the equipment that our technical personnel are not obsolete and the facilities meet the scientific requirements is critical to accomplish the work that the Agency is tasked to do.

- With the increasing backlog of deteriorating and/or obsolete equipment (technical Infrastructure) and facilities infrastructure, there is increasing concern that critical equipment will fail and not be available to satisfy our customers' needs. We need to update NASA's equipment, processes, and procedures to be consistent with current technology;

Involvement of technical personnel in the decision making process of project/programs: There are several references to this theme. The concern relates to the lack of technically proficient personnel in the decision making process at many levels within the Agency. The primary decision making process is more financial than technical in areas that relate to research or engineering processes. By not having technical personnel involved in the process, the technical goals and objectives (scientific knowledge, engineering equipment, test schedule, etc.) are sacrificed in order to meet the financial objectives. This also includes the lack of technical personnel providing oversight to programs and projects.

- Institute a requirements team to review all Statements of Work over certain dollar thresholds.
- Involvement of technical people in project- related decision-making
- The program lacks scientific thinking in its oversight. Even now, with the CAIB report discussing the causes of the accident related to schedule, the only criterion being used for return to flight is schedule. Lip service is being given to safety of flight and vehicle improvement, but when it comes down to every decision, the driver is schedule, even if approaches are taken to meet it which give the appearance of improvement without any provable benefit.

Elimination of limited value added process: Many individuals look at business processes (ISO, VPP, etc.) as unnecessary to achieve the goals and objectives of the Agency. These processes take significant effort to implement, maintain, and take resources (funds, personnel, etc.) that could be better utilized in the implementation of primary Agency programs. Many of these programs define requirements that seem, to the implementer, to be inconsistent. These requirements include the management of records, the enforcement of compliance to requirements and their implementation within the program/project. These inconsistencies negatively affect the "real work" to be done.

- Eliminate business processes that add little value and create overhead work for all employees

LEADERSHIP

The data show that NASA leadership should focus on making decisions for the good of the Agency, and be held accountable for the outcomes of their decisions. Agency leaders must also revisit strategic planning from the perspective of its workforce, and demonstrate respect for others.

Leaders need to make firm decisions regarding allocation of resources: Leaders must be willing to make the tough choices and then act on what is best for the Agency.

- "Decisions must be made with the full understanding of tradeoffs between schedule, cost, and performance, along with management and political considerations."
- "Many decision made today are made without considering all the facts and with little input from the technical community."
- "Decisions are not made, and if decisions are made, often there is no real follow-through. Too many high priority actions--everything is deemed highly important."

Employees and managers should be held accountable: Items under Accountability suggest that NASA leadership must do more to enforce performance standards and then live up to those standards.

- "The Agency needs to do away with the "pass/fail" method of handling personnel evaluations. This method does not support keeping employees accountable for the work they do. The Agency needs performance standards for personnel and a better way to get rid of employees who don't perform."
- "Line managers within NASA are told that they can run 'their' organizations as they see fit. When contradictions between agency policies and the actual way we do business are identified, the arbitrary decisions by line managers are followed rather than agency policies. It will be impossible to create 'One NASA' as long as line managers are allowed to continue to create their own independent policies and procedures."

More complete strategic planning is needed: Comments also indicate that the employees seek more clear-cut and easily applicable goals for the Agency. Some of the feedback in this area refers to the lack of a National vision for NASA, but there is also a perceived lack of goals and strategic direction at the working level.

- "We need to have a clearer strategic vision for the agency"
- "Almost completely throughout my local organization the sense it that the Agency lacks any direction, vision, or focus other than RTF and ISS. The Agency lacks any credible plan or strategy that employees believe in and will back. The key to the success of this Agency is the creative people who work here."
- "Planning is not given the attention that it needs - by the time we receive it is behind schedule."

Leaders must treat others with respect: Employees reported that leadership does not demonstrate respect for the NASA workforce, and frequently fails to listen to working level employees. This connects to the data concerning the culture of the Agency being one of disrespect where alternative points of view are not considered valid. Whereas the comments under Culture refer to the pervasive lack of respect and openness, the comments listed here are clearly aimed at leadership behaviors.

- "New managers coming in and making changes before listening to the existing workforce on how it is being done is a challenge; managers should use consideration and respect for the existing programs and processes before making major decisions"
- "NASA leaders need to tailor processes to ensure all viewpoints are presented and demonstrate that open dissension is accepted and encouraged. We need to improve the message given to the NASA organizations that everyone is heard"
- "NASA leaders should allow frank and open discussions in all meetings and NASA gatherings"

LEARNING

The comments under this category focused on many issues related to training and development. While some comments were very specific and called out skills that need improvement, others talked about the overarching Agency strategy for leadership development.

NASA Lacks specific skills and capabilities: Lack of capability and competency to adequately and safely deliver products and meet mission goals, including lack of skills, competencies, knowledge of internal practices, etc. This lack of capability applied to engineers and scientists, technical managers, SR&QA staff, program and project managers, and contractors in all of these roles.

- "NASA should broaden current skills and recognize the specific deficiencies of knowledge and upgrade those skills. We need to follow through with a prescribed curriculum on enrichment and provide a leadership track for all employees"
- "The only way to truly rebuild capability is by encouraging and funding in-house cradle-to-grave projects. These projects have been extremely rare in the last 20 years. This is the only way our engineering staff can obtain the necessary experience to truly be able to provide legitimate insight into contractor engineering"
- "NASA employees must feel comfortable in their knowledge and use of Standard Practices and Procedures. However, there is no training or process that covers the "how to" of using the organizational interfaces, lines of communications, and control boards for problem resolution. Many do not understand the "big picture" of how and why ground processing information and issues are routed, for example. Process definition, training, and table-top simulations are suggested to help employees understand these processes"

Need for a "Lessons Learned" database: Overwhelmingly the data supports the need for an improved "lessons learned process." This includes the value and rigor associated with lessons learned, the methods by which we approach lessons learned (including how staff are introduced to and trained in the processes) and its relationship to organizational memory.

- "We need an improved lessons learned process. …current process does not provide good context for assessing value of the lesson. …we should consider meetings of practitioners in workshops to discuss issues and solutions;
- NASA can significantly improve our knowledge management culture with lessons learned processes, trend analyses, transferring expert knowledge from people to systems, and portals that share information;
- NASA needs to find a way to retain organizational memory. We lose knowledge every time we reorganize or a significant number of people retire or leave for whatever reason. We waste time and resources as a result when "rediscovering the wheel"

Knowledge and information sharing: The data suggests that even if the organization had a process by which it adequately captured knowledge (through lessons learned or other related activities), that the ability to share that information widely is lacking. In addition, some knowledge either is at risk for being lost or is already lost through the process of contracting out particular tasks or attrition of senior staff members. Additionally, there appears to be an unhealthy, insular approach associated with gathering and sharing knowledge across centers and agency boundaries.

- "A database of subsystem technology successes would help is sure that wheels are not reinvented. The existing database of lessons learned should be made a part of standard operating procedure for all project managers, chief engineers, and technical leads."
- Invest in knowledge engineering. We have database experts (e.g. librarians, atmospheric sciences) who may be able to teach the rest of us)

Need for an overall strategy for leadership development: One of the major issues facing NASA and its contractors is the aging workforce with a significant percentage of workforce eligible for retirement in the near future. It will be useful to have processes/tools in place, which allow for capturing knowledge from those leaving the agency (through either retirement or attrition) before that knowledge is lost.

- The focus of training, leadership development, and human capital efforts need to be assessed to ensure they are meeting and aligning with strategic mission and agency goals. In addition to reviewing the intended outcomes of these efforts, there is also a focus on reviewing the practices and approaches involved in developing individuals and leaders within the agency.
- "Training should be specific and targeted to the organization and individual. We believe there is an overabundance of directed training for non-mission essential initiatives;
- Promote well-tailored training, developing individuals, program management, leadership – the right people in the right jobs doing the right work;
- Actual "hands on" experience is severely deficient in the agency and desperately needed to provide employees an understanding of systems engineering. For example, outsourcing and performance based contracts have made it difficult for NASA civil servants to keep current in the areas they are asked to oversee and have driven them away from the mainstream work;

ORGANIZATIONAL STRUCTURE

Concern was expressed about the overall complexity of the NASA organization, the limitations of matrix management as a tool, and the perceived failure to adequately define organizational roles and responsibilities. In addition, there was a great deal of support among the workforce for a "truly independent technical authority" as outlined in the CAIB report.

Limitation of matrix structure as an organizational/management tool: The NASA organizational structure is extremely complex, creating unclear lines of responsibility, accountability, and authority.

- There should be a clear separation between the organization representing the technical requirements and the organization responsible for cost and schedule.

Complexity/Misunderstanding regarding the current organizational structure: There should be clearly defined roles, responsibilities, and accountability. Team members should have no question as to whom they report and what their role is with respect to the team.

- "One real problem the program faces is the sheer size of the leadership group and the massive number of different connections caused by multiple matrix organization paths, which leads to no clear singular authority or responsibility for anything."
- "We need to clarify the roles and responsibilities among and within NASA program elements. We need clear lines of authority for decisions affecting engineering, budget, contracts, and launches"

Need for an Independent Technical Authority: Truly independent safety oversight is needed. The S&MA organization should report to top NASA management - not Center directors or program directors. S&MA budgets should not come from the programs that they oversee S&MA should never have to justify its budget to a program. This represents a serious conflict of interest. The cost of having a true, strong, oversight organization is miniscule to the cost of an accident!

- "Any Independent Safety Assessment organization should never be staffed primarily with entry-level engineers. It should be organized; lead; and mainly staffed by seasoned safety professionals that understand what and how system safety is and works and are familiar with high-risk complex systems."
- "As long as the Safety & Mission Assurance Office and the Engineering Directorate receives funding from the programs/projects, their independence is subject to question."

RESOURCE MANAGEMENT

In general, program and project schedule and budget estimates are unrealistic with respect to the estimated workload, and not enough contingency is built into the plans to respond to the inherent uncertainties of the business. This is partially driven by the quantity of work that exceeds the quantity of workers available to perform it; this lack of needed personnel is compounded by NASA's schedule-driven culture.

Planning/prioritization process: Priorities during program implementation are frequently unclear and decisions regarding priorities are poorly communicated, leaving the workforce to treat too many tasks as emergencies, which makes deadlines all the more unreasonable. In fact, concern was expressed that managers are not allotted enough time for planning and setting priorities as conditions change during implementation.

- "There needs to be realism in deciding schedule, budget, and workforce requirements so that shortcuts and workarounds in processes are not taken and staff does not become overworked and stressed with a reduced awareness and increased likelihood of making errors."
- ". . . too few people, too busy on too many urgent matters to communicate effectively, follow up, and nurture employees."

Doing too much with too little: There are simply not enough resources to go around. This results in a stressed, overtaxed workforce that is forced to cut corners and invent "workarounds" in a futile attempt to meet deadlines. This burden is worsened by excessive administrative and clerical tasks heaped upon technical personnel.

- "People are human—they can only do so much effectively."

- "I feel that I am doing as little as necessary to come to a conclusion regarding an issue and am not comfortable working in this manner."

Schedule as driver: The quality of work and safety are consistently being compromised to meet schedule, which has become the primary driver in project implementation. Work-arounds, cutting corners, and "good enough" have become the norm in this schedule-driven culture, a condition with which the technical workforce is not satisfied. In addition, the added risk of enforcing a schedule when unanticipated events occur is not adequately analyzed.

- "The culture has come to emphasize 'just do the best you can by the deadline.' This doesn't mean 'do the best you can.'"
- "Echoing the CAIB report, many employees expressed their concern that managers make engineering and safety compromises to achieve schedule, budget, or other programmatic goals throughout all aspects of our activities."

SAFETY

Safety was one of the biggest categories. To ensure that no level of detail was lost it was necessary to create six sub-categories. Each sub-category is outlined below and a few quotes from each are provided.
Cost and Schedule drivers too often influence safety: The more important cost and especially schedule demands often have impacts on safety. Enough safety-related analysis is often not done in an environment of safe until proven otherwise.

Clarify and strengthen the safety organizations independence, funding, authority, and responsibility:

- "Quality Assurance is often the first area that is reduced due to pressure to meet budget without sacrificing performance."
- "Schedule equals cost and delays in schedule put cost pressure disproportionately on functions that can be viewed as low/no value but are critical to safe and effective performance
- "Echoing the CAIB report, many employees expressed their concern that managers make engineering and safety compromises to achieve schedule, budget, or other programmatic goals throughout all aspects of our activities"

NASA's culture promotes waivers on safety, allows for shortcuts: Too often waivers are granted on safety related requirements.

- "Echoing the CAIB report, many employees expressed their concern that managers make engineering and safety compromises"
- "'Normalization of Deviance' by relying on past success instead of an inquisitive perspective backed by sound engineering analysis, compromises NASA's ability to anticipate (and mitigate) what can go wrong with our systems and missions. (1) And check the box thing. Not taken critically enough, similarly, too easy to get exceptions to requirements".
- "I have heard (post Columbia accident) from senior flight controllers in my group make the statement that since a certain piece of equipment has not failed yet in flight history, that it's unlikely to ever fail. Obviously this is flawed rationale, but it seems to persist."
- "The operations community seems to work from a position where "Not Analyzed" means an operation is acceptable until proven unacceptable."
- "Most safety organizations are not independent and one result is their insufficient funding that often gets decreased because of other project demands. Moreover, there is much widespread confusion about these organizations lines of authority, responsibility and independence"

An ombudsman should be established to help adjudicate safety-related issues: Some thought that an ombudsman could help with bringing the safety-related comments of non-management to light.

- Institute formal ombudsman functions below the Headquarters level to allow employee concerns and professional differences of opinion to be heard regarding matters specific to their work units or projects. (1) Promises to achieve schedule, budget, or other programmatic goals throughout all aspects of our activities then the Center's Office of Safety & Mission Assurance role, responsibility, and authority in programs and projects throughout the program/project cycle."

Software safety is a special variety of safety: Software safety is different from other safety issues because it is out of the purview of traditional safety engineers. It is strictly a software issue requiring special approaches and standards.

- Software safety is an issue, No single organization is chartered to be the champion for software safety.
- Software safety is a new idea at NASA and requires a cultural change to implement it.

Lack of expertise in NASA S&MA organizations: There are several reasons offered as to why there is not enough experience or expertise in too many of the SM&A groups. Reasons offered are the junior levels of personnel often populating these groups as well as a lack of appropriate backgrounds.

- "It seems that safety engineers are under-trained for their job. Most safety engineers do not seem to have the necessary engineering experience or training in design/analysis/test to adequately question or approve engineering data. Many are too junior."
- "The CAIB report accurately described a problematic condition in the NASA S&MA organization. The report points out the fact that NASA S&MA has been historically 'weak' in technical expertise."

Lack of a system to document, publicize, and integrate small problems/issues: There is said to be no inter-center system to help log, analyze, and integrate small problems/issues that could as a group pose a problem. Also, such problems could reveal a trend if properly aggregated and analyzed.

- "Others talked about the cumulative effect idea and the need to document littler issues so you can see if they sum to a big issue."
- "The review boards will only address the issue before them and will NOT address cumulative effects, or possible conflict of issues. The response from the board is again "Proof" that there is a cumulative effect.

Data Analysis Phase III: Identification of Major Themes and Verification

In examining each of the 34 subcategories outlined above, the team observed that several of the sub-categories were very similar in content and could be grouped together. From that list of 30, the following list of 13 Themes was identified. To verify the final list of 13, a member of the team compared our list of Themes against the original Center Reports. The results of this verification revealed that 11 of these themes appeared as main ideas on three or more Center Reports.

Under each Theme is a list of the sub-categories that fit under that theme and the number of Centers listing this theme as a Major Theme on their Center Report.

1. NASA needs an increased value on respect for others. All those affected by the decision should be part of the decision making process. Leaders should have the responsibility to provide employees with full information regarding decisions, including options considered, and rationale for making final choice.
   Leadership: Leaders must treat others with respect
   Culture: Respect for others and cooperation
   Civil Service/Contractor Issues: Contractors treated as second-class citizens
   Technical: Involvement of technical personnel in the decision making process of project/programs
   Number of Centers Identifying this Theme as Major Theme: 4 (36%)

2. NASA should willfully seek out and understand minority opinions. This includes establishing a process to collect anonymous feedback, and holding meetings that encourage open discussion.
   Culture: Embrace minority opinions
   Communication: Lack of a process for delivering upward feedback
   Number of Centers Identifying this Theme as Major Theme: 8 (73%)

3. Resources of time, human capital, and cash flow should be allocated realistically and according to the design standards set forth at conception.
   Culture: Balanced and realistic use of resources
   Resource Management: Schedule as driver
   Resource Management: Doing too much with too little
   Resource Management: Planning/prioritization process
   Safety: NASA's culture promotes waivers on safety, allows for shortcuts
   Number of Centers Identifying this Theme as Major Theme: 8 (73%)

4. NASA should avoid being tied up in unnecessary processes, or lengthy approvals that draw resources away from goal achievement. Appropriate procedures should be established, and followed from project conception to completion.
   Technical: Elimination of limited value added process (red tape)
   Number of Centers Identifying this Theme as Major Theme: 4 (36%)

5. Decisions should be made based on what is best for the Agency, be placed in context using Agency priorities, guide allocation of resources, and be fully rationalized and communicated to the workforce.
   Safety: NASA's culture promotes waivers on safety, allows for shortcuts
   Leadership: Leaders need to make firm decisions regarding allocation of resources
   Communication: Message of "what" is delivered without "why," leaders should close the loop
   Technical: upgrade facilities, equipment
   Number of Centers Identifying this Theme as Major Theme: 8 (73%)

6. Strategic planning should be relevant for every employee, include human capabilities needed for the future, and be the baseline for on going initiatives.
   Leadership: More complete strategic planning is needed
   Learning: NASA lacks specific skills and capabilities

Change Management: Number of initiatives across the agency
Number of Centers Identifying this Theme as Major Theme: 8 (73%)

7. The agency needs a strategy for leadership development that includes/supports a specific set of skills for all levels of management. These skills should then be used for evaluating performance and making personnel decisions such as promotions and awards.
   Learning: Need for an overall strategy for leadership development
   Leadership: Employees/mgrs should be held accountable
   Number of Centers Identifying this Theme as Major Theme: 8 (73%)

8. NASA should use/design ONE tool to capture expertise and lessons learned in all areas. Tool should be easily accessible, and actively used by the workforce.
   Learning: Need for a "Lessons Learned" database
   Learning: Knowledge and information sharing
   Safety: Lack of a system to document, publicize, and integrate small problems/issues
   Number of Centers Identifying this Theme as Major Theme: 3 (27%)

9. NASA needs to clarify the organizational structure of the Agency. Current matrix system is too complex and is not perceived as a useful management tool.
   Organization Structure: Limitations of matrix structure as an organizational tool
   Organization Structure: Complexity/Misunderstanding regarding current organizational structure
   Number of Centers Identifying this Theme as Major Theme: 5 (45%)

10. Contractors should not be used to supply core competency expertise. Building from an inclusive strategic plan the Agency should determine what capabilities should be kept in house, and what capabilities should be provided by contractors.
    Civil Service/Contractor Issues: NASA's over reliance on contractors
    Civil Service/Contractor Issues: Deterioration of Civil Servant capability
    Number of Centers Identifying this Theme as Major Theme: 0 (0%)*

11. NASA needs a truly independent safety organization as described in the CAIB report. This organization should serve as a clearinghouse for any safety related concerns from any employee.
    Safety: Clarify/Strengthen Safety Organization: independence, funding, authority, responsibility
    Safety: An ombudsman should be established to help adjudicate safety-related issues
    Safety: Need for an Independent Technical Authority
    Number of Centers Identifying this Theme as Major Theme: 5 (45%)

12. Safety expertise should exist for every specific discipline within the Agency.
    Safety: Lack of expertise in NASA S&MA organizations
    Safety: Software safety is a special variety of safety
    Number of Centers Identifying this Theme as Major Theme: 5 (45%)

13. Safety and Mission Success Week comments
    Number of Centers Identifying this Theme as Major Theme: 0 (0%)**

* The Civil Service/Contractor Issues Theme and the Safety and Mission Success Week Comments Theme did not appear on any Center Report, yet when we examined the data set, they emerged as areas that should be addressed. It is very interesting that although the Civil Service/Contractor Issues Theme accounted for 106 (6%) of the total 1810 comments, it was not captured as a main idea by any of the individual Centers.

**The Data Team thought it was important to separate out the process comments related to Safety and Mission Success Week itself. These comments provide some key learnings for future initiatives, and thus deserve consideration as a separate Theme. Overall only 22 (1%) comments addressed Safety and Mission Success Week. These comments indicated: miscommunication regarding the purpose of the Week, healthy skepticism regarding use of this feedback, inconsistent practices between codes/Centers, and some felt that they were not provided with significant time to hold meaningful discussions and provide feedback in the allotted timeframe.